

Rebar corrosion and sulfate resistance of blast-furnace slag cement

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Abstract: This study was designed to evaluate the relative corrosion and sulfate resistance of concrete made with portland cements containing 2%-14% C3A without and with 50%, 60%, 70%, and 80% cement replacement by blast-furnace slag (BFS). The results show that BFS blended-cement concretes had a significantly superior corrosion-resistance performance. The best corrosion protection was obtained with 50% BFS cement, which, depending on the C3A content of the parent cement, showed a 3.82-3.16 times better performance in terms of corrosion-initiation time compared to the parent plain-cement concrete. BFS blending was specially beneficial in improving the corrosion-resistance performance of Type V low C3A cements. Performance on exposure to sodium-sulfate (NS) solution, replacement level only at 70% and above, showed sulfate resistance to be better than that of the Type V sulfate-resistant cement. BFS blending, even with high C3A cement (9%, 11%, and 14%) at 70% and above-replacement level, imparted a high degree of sulfate resistance. The cement with high C3S-C2S ratio has a perceptible adverse-interactive effect and causes sulfate deterioration even with low-C3A sulfate-resistant cements. In MS-NS environment, due to the magnesium-gypsum type of attack, the 60% BFS cement deteriorated even more severely than the plain Type V and Type I cements.